

Submission under 37 C.F.R. §1.114
Application No. 10/629,806
Attorney Docket No. 030923

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions of claims in the application.

Listing of Claims

Claim 1 (currently amended): A resist pattern thickening material comprising:

a resin;

a crosslinking agent;

a nitrogen-containing compound; [[and]]

pure water; and

a polyphenol compound as a water-soluble aromatic compound,

~~a nonionic surfactant which is at least one of a polyoxyethylene polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,~~

wherein the nitrogen-containing compound is one of amine, amide, imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

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Claim 2 (original): A resist pattern thickening material according to Claim 1, wherein the nitrogen-containing compound is a basic compound.

Claim 3 (cancelled)

Claim 4 (original): A resist pattern thickening material according to Claim 1, wherein the resist pattern thickening material exhibit at least one of water-solubility and alkali-solubility.

Claims 5-8 (cancelled)

Claim 9 (original): A resist pattern thickening material according to Claim 1, wherein the crosslinking agent is at least one of a melamine derivative, a urea derivative, and an uril derivative.

Claims 10 and 11 (cancelled)

Claim 12 (original): A resist pattern thickening material according to Claim 1, further comprising a resin containing an aromatic compound in a portion thereof.

Claim 13 (previously presented): A resist pattern thickening material comprising:

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a first resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a second resin containing an aromatic compound in a portion thereof,

wherein the second resin containing the aromatic compound in a portion thereof is at least one of a polyvinyl aryl acetal resin, a polyvinyl aryl ether resin, and a polyvinyl aryl ester resin.

Claim 14 (original): A resist pattern thickening material according to Claim 1, further comprising an organic solvent.

Claim 15 (original): A resist pattern thickening material according to Claim 14, wherein the organic solvent is at least one of an alcohol solvent, a chain ester solvent, a cyclic ester solvent, a ketone solvent, a chain ether solvent, and a cyclic ether solvent.

Claim 16 (currently amended): A resist pattern comprising:

an inner layer of a resist pattern; and

a surface layer of a resist pattern provided on the inner layer, the surface layer being a resist pattern thickening material comprising:

a resin;

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a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a polyphenol compound as a water-soluble aromatic compound,

~~a nonionic surfactant which is at least one of a polyoxyethylene polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,~~

wherein the nitrogen-containing compound is one of amine, amide, imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 17 (currently amended): A process for forming a resist pattern, comprising:

applying a resist pattern thickening material onto a resist pattern to be thickened after forming the resist pattern to be thickened so as to cover a surface of the resist pattern to be thickened,

wherein the resist pattern thickening material comprises:

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a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a polyphenol compound as a water-soluble aromatic compound,

~~a nonionic surfactant which is at least one of a polyoxyethylene polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,~~

wherein the nitrogen-containing compound is one of amine, amide, imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 18 (original): A process for forming a resist pattern according to Claim 17, wherein a material of the resist pattern to be thickened is at least one of a novolak resist, a polyhydroxystyrene (PHS) resist, an acrylic resist, a cycloolefin - maleic acid anhydride resist, a cycloolefin resist, and a cycloolefin - acryl hybrid resist.

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Claim 19 (previously presented): A process for forming a resist pattern according to
Claim 17, further comprising:

developing the resist pattern thickening material, after applying the resist pattern
thickening material.

Claim 20 (currently amended): A semiconductor device comprising:
a pattern formed by using a resist pattern thickened by using a resist pattern thickening
material,

wherein the resist pattern thickening material comprises:

a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a polyphenol compound as a water-soluble aromatic compound,

~~a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene
condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether
compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary
alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty~~

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~~acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,~~

wherein the nitrogen-containing compound is one of amine, amide, imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 21 (currently amended): A process for manufacturing a semiconductor device comprising:

applying a resist pattern thickening material onto a resist pattern to be thickened, after the resist pattern to be thickened is formed, so as to thicken the resist pattern to be thickened and form the resist pattern; and

patterning the underlying layer by etching using the resist pattern as a mask so as to pattern the underlying layer,

wherein the resist pattern thickening material comprises:

a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a polyphenol compound as a water-soluble aromatic compound,

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~~a nonionic surfactant which is at least one of a polyoxyethylene polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,~~

wherein the nitrogen-containing compound is one of amine, amide, imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 22 (currently amended): A resist pattern thickening material ~~according to claim 1~~ comprising:

a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary

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alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxyate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant and an ethylene diamine surfactant,

wherein the nitrogen-containing compound is one of imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 23 (currently amended): A resist pattern ~~according to claim 16~~ comprising:

an inner layer of a resist pattern; and

a surface layer of a resist pattern provided on the inner layer, the surface layer being a resist pattern thickening material comprising:

a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxyate surfactant, a fatty

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acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,

wherein the nitrogen-containing compound is one of imide, quaternary ammonium, and a derivative thereof.

wherein the resin is at least one of polyvinyl alcohol, polyvinyl alcohol, and polyvinyl acetate.

Claim 24 (currently amended): A process for forming a resist pattern ~~according to claim 17~~ comprising:

applying a resist pattern thickening material onto a resist pattern to be thickened after forming the resist pattern to be thickened so as to cover a surface of the resist pattern to be thickened,

wherein the resist pattern thickening material comprises:

a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary

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alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxyate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,

wherein the nitrogen-containing compound is one of imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 25 (currently amended): A semiconductor device ~~according to claim 20~~ comprising:

a pattern formed by using a resist pattern thickened by using a resist pattern thickening material,

wherein the resist pattern thickening material comprises:

a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary

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alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,

wherein the nitrogen-containing compound is one of imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 26 (currently amended): A process for manufacturing a semiconductor device ~~according to claim 21~~ comprising:

applying a resist pattern thickening material onto a resist pattern to be thickened, after the resist pattern to be thickened is formed, so as to thicken the resist pattern to be thickened and form the resist pattern; and

patterning the underlying layer by etching using the resist pattern as a mask so as to pattern the underlying layer,

wherein the resist pattern thickening material comprises:

a resin;

a crosslinking agent;

a nitrogen-containing compound;

pure water; and

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a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant,

wherein the nitrogen-containing compound is one of imide, quaternary ammonium, and a derivative thereof,

wherein the resin is at least one of polyvinyl alcohol, polyvinyl acetal, and polyvinyl acetate.

Claim 27 (new): A resist pattern thickening material according to claim 1,

wherein the resist pattern thickening material further comprises a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant.

Claim 28 (new): A resist pattern according to claim 16,

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wherein the resist pattern thickening material further comprises a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant.

Claim 29 (new): A process for forming a resist pattern thickening material according to claim 17,

wherein the resist pattern thickening material farther comprises a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant.

Claim 30 (new): A semiconductor device according to claim 20,

wherein the resist pattern thickening material further comprises a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty

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acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant.

Claim 31 (new): A process for manufacturing a semiconductor device according to claim 21,

wherein the resist pattern thickening material further comprises a nonionic surfactant which is at least one of a polyoxyethylene-polyoxypropylene condensation product, polyoxyalkylene alkylether compound, a polyoxyethylene alkylether compound, a sorbitan fatty acid ester compound, a glycerin fatty acid ester compound, a primary alcohol ethoxylate compound, a phenol ethoxylate compound, an alkoxylate surfactant, a fatty acid ester surfactant, an amide surfactant, an alcohol surfactant, and an ethylene diamine surfactant.